Evaluation of breast symptoms with mammography and ultrasonography

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Abstract

Introduction: Aim of the study was to discern which are more frequent symptoms presented in malign and benign masses diagnosed by mammography and ultrasonography.

Methods: Our study group consisted of 546 female patients, with breast symptoms such as palpable lumps (40.8%), pain in the breast (26%), localized lumpiness or nodularity (13.7%), nipple retraction (11.2%), nipple bloody discharge (5.1%) and redness and swelling of the breast (3.1%). All 546 patients were examined by ultrasonography and mammography. Biopsy was performed according to the findings of mammography and ultrasonography.

Results: In breast cancer detection ultrasonography showed an efficiency of 79.4% compared to 55.0% for mammography in detecting breast lump, in the case of nipple retraction mammography showed an efficiency of 89.1% compared to 80.4% for ultrasound, while the lowest efficiency for mammography was in the cases with localized lumpiness or nodularity 17.1% compared to 45.7% for ultrasound. In detecting fibrocystic changes where the most common symptoms was pain, ultrasonography showed an efficiency of 99.3 % compared to 84.2 % for mammography.

Conclusions: Our study confirmed that breast lumps are detectable in the majority of patients with breast cancer. The most frequent symptoms in patient with benign lesions were pain or localized discomfort. The diagnostic accuracy for carcinomas of the breast and for benign lesions according to symptoms was higher for ultrasound than for mammography.

Keywords: Mammography, ultrasonography, breast symptoms

Introduction

Breast cancer represents a significant public health problem in Kosovo. Despite the gloomy prognosis, increased morbidity and reduced survival time, it can be controlled if detection and diagnosis are made in the earliest stages in the pre-invasive and clinically nonpalpable stages. Bilateral mammography should be the first imaging study performed in patients over the age of 30 who present with breast masses that are suspicious for carcinoma (1). The primary reason for performing mammography in a patient with a suspicious palpable mass is to assess the affected breast for multifocal disease and the contralateral breast for suspicious abnormalities that should be biopsied concurrently (2). If mammography is negative in a patient with a clinically evident mass and dense breast, ultrasound is often suggested as a subsequent imaging study (3, 4). Women under the age of 30 who have a focal suspicious palpable abnormality are frequently first evaluated with ultrasound (5, 6). Many early breast carcinomas may be asymptomatic (7). If the patient has not noticed a lump, then symptoms indicating the possible presence of breast cancer may include the following: change in breast size or shape, skin dimpling, recent nipple inversion or skin change, single-duct discharge, particularly if bloodstained, axillary lump. Pain or discomfort is not usually a symptom of breast cancer. A lump is the first symptom in over 80 percent of all patients with breast cancer. The nature of palpable lumps is often difficult to determine clinically, but the following features should raise concern:

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Hardness, irregularity, focal nodularity, asymmetry with the other breast, fixation to skin or muscle. Mammographic features suggestive of malignancy include asymmetry, microcalcifications, a mass or architectural distortion. If any of these features are identified, a diagnostic mammogram along with a breast ultrasound should be performed prior to obtaining a biopsy (8-10). Ultrasonographic evaluation in addition to mammography can help distinguish between solid and cystic lesions, accurately determine the size of a spiculated lesion and guide accurate biopsy of a suspicious area (11-13). As a screening device, the ultrasound is limited by a number of factors, but most notably by the failure to detect microcalcification. Ultrasonographic features of malignancy include the following: Poorly defined borders, heterogeneous internal echoes, disruption of the tissue layers, irregular shadowing, superficial echo enhancement, depth greater than height, high vascular density and flow rates on doppler images (14-17). Nipple retraction may be caused by aging, ductectasia or breast cancer. A mammogram and breast ultrasound will help determine the cause of the nipple change (18). Breast discharge is a common problem and is rarely a symptom of cancer. The characteristics of nipple discharge that should raise the index of suspicion for malignancy are spontaneous and unilateral discharge that is bloody, seroanguineous or watery in consistency and is associated with an underlying mass (19). Breast pain can be due to many possible causes. Most likely breast pain is from hormonal fluctuations from menstruation, pregnancy, puberty, menopause, and breastfeeding. Breast pain can also be associated with fibrocystic breast disease, but it is a very unusual symptom of breast cancer (15, 20). Aim of the study was to discern which are more frequent symptoms presented in malign and benign masses diagnosed by mammography and ultrasonography.

Methods

A group of 546 female patients with breast symptoms, such as palpable lumps, pain in the breast, nipple discharge, localized lumpiness or nodularity, nipple retraction, and redness and swelling of the breast were examined independently with ultrasound and mammography, diagnosis was confirmed with biopsy. Mammography was performed in a stand type Alpha RT imaging, General Electric Medical Systems. Mediolateral oblique and craniocaudal images was obtained and assessed carefully. Mammograms were interpreted according to the Breast Imaging Reporting and Data System, diagnostic categories on a five-point scale. Ultrasound examination were performed using a high-resolution unit (Aloka SSD 620; Tokyo, Japan and Mindray DP 1100 Plus) with linear array probe centred at 7.5 MHz. All ultrasound examination were performed with the patient in a supine position for the medial parts of the breast and in a contralateral posterior oblique position with arms raised for the lateral parts of the breast. Diagnoses were scored on a five-point scale identical to the mammographic BI-RADS categories. A total of 546 breast lesions were examined by histological methodology. Histopathology results revealed the presence of 259 invasive cancers and 287 benign lesions.

Statistical analysis

χ^2 test and student t-test were used for statistical data processing. The significance of differences observed was assessed using Pearson's chi-square test, with $p< 0.01$ considering being statistically significant.

Results

The study included 546 patients with breast symptoms. The most frequent malignant symptoms in the 259 cases with breast cancer was lump with 160 cases or 61.8% , being dominant symptoms,

TABLE 1. Breast symptoms in malign and benign changes

Breast symptoms	Breast changes					
	Benign		Malign		Total	
	N	%	N	%	N	%
	287	100.0	259	100.0	546	100.0
Lump	63	22.0	160	61.8	223	40.8
Nipple retraction	15	5.2	46	17.8	61	11.2
Pain	139	48.4	3	1.2	142	26.0
Nipple bloody discharge	21	7.3	7	2.7	28	5.1
Localised nodularity	40	13.9	35	13.5	75	13.7
Redness and swelling (mastitis)	9	3.1	8	3.1	17	3.1
P<0.01						

TABLE 2. Breast cancer symptoms according to age

Symptoms	Patient age-group									
	30-39		40-49		50-59		60-69		70-79	
	N	%	N	%	N	%	N	%	N	%
	26	100.0	57	100.0	66	100.0	61	100.0	49	100.0
Lump	24	92.3	30	52.6	38	57.6	39	63.9	29	59.2
Nipple retraction	-	-	11	19.3	9	13.6	8	13.1	18	36.7
Pain		-	-	1	1.8	2	3.0	-	-	-
Nipple bloddy discharge	-	-	3	5.3	3	4.5	1	1.6	-	-
Localised nodularity	-	-	12	21.1	13	19.7	10	16.4	-	-
Redness and swelling	2	7.7	-	-	1	1.5	3	4.9	2	4.1

TABLE 3. Benign breast symptoms according to age

Symptoms	Patient age-group										
	30-39		40-49		50-59		60-69		70-79		
	N	%	N	%	N	%	N	%	N	%	
	35	100.0	65	100.0	73	100.0	63	100.0	51	100.0	
Lump	19	54.3	15	23.1	14	19.2	10	15.9	5	9.8	P<0.01
Nipple retraction		0.0	1	1.5	2	2.7	7	11.1	5	9.8	
Pain	4	11.4	30	46.2	37	50.7	41	65.1	27	52.9	P<0.01
Nipple bloddy discharge	2	5.7	5	7.7	11	15.1	3	4.8		0.0	
Localised nodularity	3	8.6	12	18.5	9	12.3	2	3.2	14	27.5	
Redness and swelling	7	20.0	2	3.1		0.0		0.0		0.0	

TABLE 4. Breast symptoms according to patient age – statistical parameters

Symptoms	Breast changes									T-test	
	Malign			Benign			Total			T=	P=
	N	Xb	SD	N	Xb	SD	N	Xb	SD		
Lump	160	55.6	13.0	63	49.1	13.4	223	53.8	13.4	3.29	P>0.01
Nipple retraction	46	62.2	13.5	15	64.5	9.8	61	62.8	12.6		
Pain	3	49.7	7.5	139	58.8	11.3	142	58.6	11.3		
Nipple bloody discharge	7	50.7	7.3	21	51.1	8.5	28	51.0	8.1		
Localized nodularity	35	55.4	6.9	40	57.8	14.1	75	56.7	11.3		
Redness and swelling	8	56.6	16.1	9	35.6	6.2	17	45.5	15.8	3.65	P<0.01

SD- Standard deviation, Xb- average age, T- student T test, P- value.

and significantly more frequent than the benign changes, 63 cases or 22.0% of them. In second place comes nipple retraction with 46 cases or 17.8%, significantly more frequent than in benign changes of 5.2%. The most frequent symptoms in patient with benign lesions were pain or localized discomfort with 139 cases or 48.4%, significantly more frequent than in the patient with malignant lesions, only 1.2%. The bloody discharge was most frequent in benign lesions, but with less frequency, 7.3%, to 2.7% of malignant lesions. Changes between malignant and benign lesions according to symptoms was statistically significant (P <0. 01) (Table 1). Table 2 shows that among the malignant and benign changes are presented considerable differences in the prevalence rate of symptoms and the tendency of movement according to age group. In malign lesions lump had the highest rate of prevalence in all age groups, especially on young patients, 92. 3%, while in other groups was 52. 6% in age 40-49 up to 63. 9% in the age group 60-69. Among other symptoms, nipple retraction was presented at over 40 ages and tends to increase according to age groups, up to 36. 7% in age group 70-79%. Table 3 shows in patient with benign lesions, the most common symptoms, pain, has shown a tendency to increase according to age, from 11. 4% in the age group 30-39 up to a maximum of 65. 1% of age 60-69. This symptom has dominated in all age group, in addition to more young patients. Symptoms of the second frequency, lump had the opposite ten-

TABLE 5. Sensitivity of mammography in breast cancer diagnosis according to symptoms

Symptoms	Mammography detected lesions in breast					
	Yes		No		Total	
	N	%	N	%	N	%
Patients	135	52.1	124	47.9	259	100.0
Lump	88	55.0	72	45.0	160	100.0
Nipple retraction	41	89.1	5	10.9	46	100.0
Pain		0.0	3	100.0	3	100.0
Nipple bloody discharge		0.0	7	100.0	7	100.0
Localized nodularity	6	17.1	29	82.9	35	100.0
Redness and swelling		0.0	8	100.0	8	100.0

TABLE 6. Sensitivity of ultrasound in breast cancer diagnosis according to symptoms

Symptoms	Ultrasound detected lesions in breast					
	Yes		No		Total	
	N	%	N	%	N	%
Patients	188	72.6	71	27.4	259	100.0
Lump	127	79.4	33	20.6	160	100.0
Nipple retraction	37	80.4	9	19.6	46	100.0
Pain		0.0	3	100.0	3	100.0
Nipple bloody discharge		0.0	7	100.0	7	100.0
Localized nodularity	16	45.7	19	54.3	35	100.0
Redness and swelling	8	100.0		0.0	8	100.0

TABLE 7. Comparative sensitivity of mammography and ultrasound in breast cancer diagnosis according to symptoms

Symptoms	Patient	Mammography		Ultrasound	
	N	N	%	N	%
Total	259	135	52.1	188	72.6
Lump	160	88	55.0	127	79.4
Nipple retraction	46	41	89.1	37	80.4
Pain	3		0.0		0.0
Nipple bloody discharge	7		0.0		0.0
Localised nodularity	35	6	17.1	16	45.7
Redness and swelling	8		0.0	8	100.0

TABLE 8. Comparative specificity of mammography and ultrasound according to symptoms

Symptoms	Patient	Mammography		Ultrasound	
	N	N	%	N	%
Total	287	212	73.9	254	88.5
Lump	63	55	87.3	63	100.0
Nipple retraction	15	15	100.0	15	100.0
Pain	139	117	84.2	138	99.3
Nipple bloody discharge	21	8	38.1	12	57.1
Localised nodularity	40	17	42.5	24	60.0
Redness and swelling	9		0.0	2	22.2

dency, decreasing according to age. The most common has been in age group 30-39, 54.3%, while in other age group has lower values and ranges from 23.1%, in age 40-49 to 9.8% in age 70-79. As for the pain as well as lump differences according to age groups were significant (P <0. 01), but with opposite directions. Trend growth has also shown nipple retraction, but with lower values, from 0.0% in the 30-39 age group up to 11.1% of age group 60-69. Table 4 shows breast symptoms according to patient age. The average age of all cases according to symptoms was higher in cases with nipple retraction, 62.8 age and in the cases with pain, 58.6 age, while cases with mastitis was younger, the average age was 45,5. Between malignant and benign lesions, the average age has changed significantly only in cases with lump and those with mastitis. Cases with malignant lump were older the average age was 55.6, to 49.1 age with benign lump. Cases with mastitis have significant difference according to age 56.6 in malign lesions to 35.6 in benign lesions. For other symptoms, there weren't considerable changes in age. Table 5 shows that the sensitivity of mammography in breast cancer detection, according to symptoms was variable. The higher sensitivity was in the nipple retraction, 89.1%, on average was in lump, 55,0%, while the lowest sensitivity was in the cases with localized lumpiness or nodularity 17.1%. In the cases with rare symptoms like pain, nipple bloody discharge and redness and swelling (mastitis), not revealed any case with mammography. Results of mammography according symptoms were statistically significant, that may indicate the interconnection of sensitiv-

ity of mammography with dominant symptoms of patient. Table 6 shows that with ultrasound we obtained different results according to symptoms. Sensitivity was higher in cases with redness and swelling (mastitis carcinomatosa), 100. 0%. In cases with nipple retraction sensitivity was 80. 4% and in cases with lump was 79. 4%. The sensitivity for localized lumpiness or nodularity was 45. 7%, while in the rare cases with nipple bloody discharge and pain with ultrasound is not diagnosed. Table 7 shows that the comparing the sensitivity of mammography and ultrasound in breast cancer detection, according to symptoms ultrasound has better results in most symptoms, especially in redness and swelling (mastitis carcinomatosa) and lump, while in case with nipple retraction sensitivity was high in both methods, and the difference is small, in favour of mammography. In 3 cases with pain and 7 cases with nipple bloody discharge, neither method have not shown efficacy. Table 8 shows that the specificity of mammography was highest in cases with nipple retraction, were diagnosed all the 17 cases, 100.0%. Also, specificity was higher on the cases with frequent symptoms, as lump, 87.3% and pain 84.2%. Specificity was lowest in the nipple bloody discharge, 38.1% and localized lumpiness or nodularity, 42.5%, while in cases with redness and swelling (mastitis) there wasn't diagnosed any case. The specificity of ultrasound was very high in cases with lump and nipple retraction, 100.0% and cases with pain, 99.3%. Specificity was lowest in cases with localized lumpiness or nodularity, 60.0%, and nipple bloody discharge, 57.1%, while on the weak was in the cases with redness ad swelling (mastitis) with only 22.2%. Comparing the specificity of these methods we noted that both methods have high specificity, especially for cases with more frequent symptoms, but the specificity of ultrasound has been something higher for all symptoms.

Discussion

Breast cancer is the most common cancer as well as leading cause of cancer deaths in women worldwide (21). Early detection with screening mammography is the only proven way to lower mortality from breast cancer (8, 9). Signs and symptoms of breast cancer may include: A breast lump or thickening that feels different from the surrounding tissue, bloody discharge from the nipple, change in the size or shape of a breast, changes to the skin over the breast, such as dimpling, inverted nipple, peeling or flaking of the nipple skin, redness or pitting of the skin over breast, like the skin of an orange, a lump in the underarm area. Breast lumps are detectable in the majority of patients with breast cancer (10). The incidence of this complaint can range from 65% to 76%, depending on the study. The typical breast cancer mass tends to be solitary, unilateral, solid, hard, irregular, and nontender. Breast pain is the presenting symptom in 5% of patients; breast enlargement, in 1%; skin or nipple retraction, in 5%; nipple discharge, in 2%; and nipple crusting or erosion, in 1%. Inflammatory breast cancer is particularly aggressive, although relatively uncommon, accounting for about 5% of all breast cancers (22, 23). More often, however, a visual examination in woman with a malignancy shows retraction of the overlying skin. This can be seen when tumours deep in the breast cause shortening of fibrous septa within the breast or when more superficial tumours cause direct puckering of the skin. Not all skin retraction necessarily results from cancer. Mondor disease or superficial thrombophlebitis of the thoracoepigastric veins can cause skin retraction of the lateral aspect of the breast (24). Visual inspection is also important in identifying erythema of the breast. Erythema may be secondary to cellulitis, recent breast irradiation, or an inflammatory carcinoma. Inflammatory carcinoma is distinguished from cellulitis by the absence of tenderness and fever. On breast palpation, there often is no definite mass, but the breast appears to be engorged with erythema, skin edema (peau d'orange), and skin ridging (25). Ultrasonography may be helpful in differentiating mastitis from inflammatory breast cancer. Spontaneous nipple discharge- through a mammary duct is the second most common sign of breast cancer. Nipple discharge develops in about 3% of women with breast cancer but is a manifestation of benign disease in 90% of patients. Discharge in patients older than 50 years of age is more likely to represent cancerous rather than benign conditions. Milky or purulent discharges are associated with a negligible chance of cancer (19). Mammography should be performed before any intervention. A hematoma

resulting from percutaneous fine-needle aspiration biopsy can look similar to a small carcinoma (26). When such procedures have been performed prior to mammography, it is best to perform a follow-up mammogram 4 to 6 weeks later. Ultrasound findings can often confirm a cancer that is obscured mammographically by dense breast tissue (3, 4, 7). Women under age 20 should not undergo mammography. Ultrasound is the preferred diagnostic modality for young women under 30 with a breast mass (27). If the mass is solid and suspicious, then mammography followed by tissue diagnosis is recommended. Ultrasonography may be the only viable modality in pregnant and lactating women as it does not involve ionizing radiation and also in dense breast tissue, as density is a limiting factor for mammography (7, 11, 13).

Conclusions

Our study confirmed that breast lumps are detectable in the majority of patients with breast cancer and constitute the most common sign on history and physical examination. The most frequent symptoms in patient with benign lesions were pain or localized discomfort. Sensitivity of mammography is diminished when the breast tissue is dense. The diagnostic accuracy for carcinomas of the breast and for benign lesions according to symptoms was higher for ultrasound than for mammography.

Competing interests

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